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History of Virginia's Commercial Fisheries¹

NEGLECTED HISTORICAL RECORDS THROW LIGHT ON TODAY'S PROBLEMS

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As the Susan Constant, the Godspeed, and the Discovery made their way through Hampton Roads and up the James River toward Jamestown in 1607, they traversed a 15-mile stretch of water that was to play an important part in the history and economy of Virginia. Beneath these pleasant waters, and sometimes forming reefs that were awash at low tide, lay the most prolific natural oyster beds in the world. Three hundred and fifty years later these grounds still provide the seed that makes Virginia's oyster industry supreme, producing about one-quarter of the nation's supply of these delicious mollusks.

Had they been free to harvest at will the oysters and other seafoods that were so abundant round these shores, the colonists might have escaped some of the dietary troubles that contributed to their hardships. But ignorance, lack of experience, and other things conspired to deny these benefits to them. Today, though ignorance and self-interest still hamper the full utilization and management of these resources, we can see ever-increasing improvement. Despite dire predictions to the contrary, these resources have continued to renew themselves, and there is no reason why they should not do so forever if exploited wisely.

Several major problems face Virginia's seafood industry today. It is commonly believed that these troubles would disappear if the biological supply could be controlled. For this reason, the traditional approach to fishery management has been through biological research, and except in a few fisheries, the results have not been entirely successful. Although the historical record of Virginia's marine fisheries is brief and incomplete, the lessons to be learned from even this fragmentary history have never been fully explored. Perusal of the available records suggests that the situation is far more complex than popular opinion would suppose, and that the study of history, economics, and sociology, among others, must take equal place with biology if fishery investigations are to serve their full purpose.

¹ Contributions from the Virginia Fisheries Laboratory, No. 70.

SOURCES OF HISTORICAL MATERIAL

No complete historical account of Virginia's fisheries exists, although Pearson (1942a, b, 1943a, b, c, d) and Wharton (1948, 1949, 1957) have published excellent summaries of available knowledge on certain phases of the industry. The reports of the U. S. Commission of Fisheries and its successors the Bureau of Fisheries and the U. S. Fish and Wildlife Service, and the reports of the Virginia Commission of Fisheries, contain many references to the seafood harvest. The statistical reports of the U. S. Government have contained relatively detailed records of Virginia's fisheries since 1880, but prior to 1929, when annual summaries began, only eleven years, separated by irregular intervals, are on record. Before 1880, information on Virginia's fisheries must be culled from occasional reports, individual diaries, and the like. For example, the journals of George Washington contain numerous references to his fishing activities, conducted primarily to provide food for his slaves, although he shipped quantities of seafood to the city markets. No large commercial fishing industry existed in Virginia before the War between the States. It is the history of the period after 1865, when the fisheries as we know them today were evolving, that provides the perspective in which current problems should be viewed.

CHARACTERISTICS OF THE PENINSULA FISHERIES

Written for publication on the 350th anniversary of the landing at Jamestown, this article most appropriately should deal only with the fisheries of the historic peninsula bounded by the James and York Rivers. Unfortunately, the records are not sufficiently detailed to permit this separation from the fisheries of Virginia as a whole. But the fortunes of the fishing industry on the Peninsula are so strongly linked with those of the entire State that the lack of this specific information is not a serious handicap.

The Peninsula fisheries have their own peculiar characteristics, of course. In 1945 and 1950, although the landings in this area accounted for only 10 to 20 per cent of the total weight of raw fishery products landed in Virginia, this represented 15 to 25 per cent of the total value. The principal reason for this relatively great unit value is the almost complete absence from these landings of the relatively cheap menhaden, from which oil and meal are manufactured. On the other hand, the fisheries of the Peninsula are unusual in that they include almost all the State's landings of turtles and one-third to one-half of the catfish catch.

The oyster has always been the major product of Virginia's seafood industry. Indeed, its scientific name, *Crassostrea virginica*, "the thick (or heavy) oyster from Virginia," signifies that this is the most favored spot

along our eastern coast for oyster growth and fattening. The little port of Menchville, not far from Newport News, harbors most of the fleet of tongers that reap the State's great seed-oyster harvest.

The major development of the fisheries for blue crabs and migratory food fishes has taken place since the turn of the century. Before 1900 the lack of modern methods of preservation, the difficulty of transportation, and the lack of mechanization in the fishing fleet, restricted these seafoods to local markets. Today, one-third of all the blue crabs landed in the United States come from Virginia.

The latest and earliest comparable catch records available from the U. S. Fish and Wildlife Service are summarized in Table I. By value, oysters made up about two-thirds the total in 1890, one-half in 1954. Menhaden, the second most valuable single species in Virginia in 1954, were also fairly important in 1890, but the crab fishery, of minor importance in 1890, was third in value in 1954. In order of value, the important food fishes in 1890 were the shad, the alewife, and the sea trout; in 1954 the scup or porgy had captured first place, followed by the shad, croaker, sea bass, alewives, spot and sea trout.

TABLE I. VIRGINIA FISHERIES LANDINGS, 1890 AND 1954

Species	1890		1954	
	Weight in pounds	Value in 1954 dollars	Weight in pounds	Value in 1954 dollars
Oysters	40,453,000	8,416,000	21,225,000*	9,840,000
Blue crabs	3,025,000	184,000	34,561,000**	1,638,000
Menhaden	107,342,000	476,000	284,933,000	3,670,000
Food Fishes			70,782,000	4,423,000
Miscellaneous	34,463,000	3,288,000	1,040,000	420,000
Totals	185,282,000	12,364,000	412,541,000	19,991,000

*Pounds of meat shucked from 4,474,000 bushels of oysters.

**Total weight of crabs before picking. As prepared for market this would represent about 4,452,000 pounds of crab meat, 2,091,000 pounds of soft crabs, and about 3000 tons of dried meal and scrap.

FLUCTUATIONS IN ABUNDANCE

From very early times fears have been voiced that these bountiful resources would be depleted, and their capacity for reproduction reduced. That these fears were not groundless is illustrated by the history of the public oyster grounds, the natural, self-sustaining oyster beds of the State, that were set aside for public use in 1892. The take of market

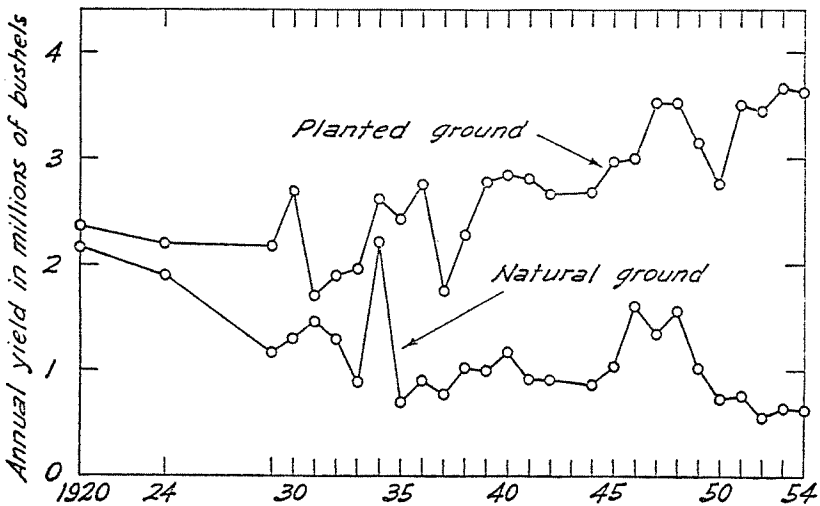


FIGURE 1. Annual landings of market-sized oysters in Virginia, 1920 to 1954.

oysters, that is, oysters three inches or more in length, from these grounds has declined steadily over the years (Table II and Fig. 1), but an approximately equal increase in the harvest from private grounds has held the total annual yield to a fairly constant level for the past 35 years. In 1858 it was reported that the oyster production of Chesapeake

TABLE II. PRODUCTION OF MARKET AND SEED OYSTERS IN VIRGINIA, AND TOTAL OYSTER PRODUCTION IN VIRGINIA AND MARYLAND, 1880 -- 1954, IN U. S. STANDARD BUSHELS

Year	VIRGINIA			MARYLAND
	Market	Seed	Total	Total
1880	....	....	9,549	13,809
1888	....	....	5,118	11,115
1890	....	....	8,483	13,614
1891	....	....	8,606	12,956
1897	....	....	9,810	9,452
1901	....	....	8,475	7,407
1904	....	....	10,632	5,771
1908	....	....	7,088	8,119
1912	....	....	8,668	7,179
1920	4,506	1,030	5,536	5,924
1924	4,102	1,982	6,084	5,541
1929	3,345	1,678	5,023	3,338
1930	3,994	2,248	6,242	3,055
1931	3,180	2,132	5,312	3,051
1932	3,198	2,050	5,248	2,550
1933	2,850	2,070	4,920	2,317
1934	4,833	2,090	7,742	2,913
1935	3,105	2,553	5,658	3,527
1936	3,673	1,180	4,853	3,402
1937	2,532	1,112	3,644	4,516
1938	3,314	1,234	4,548	4,146
1939	3,777	1,142	4,919	4,403
1940	4,026	1,289	5,315	4,264
1941	3,744	1,241	4,985	4,055
1942	3,569	981	4,550	2,974
1944	3,557	1,644	5,201	3,366
1945	3,897	1,498	5,395	3,254
1946	4,597	1,455	6,052	2,949
1947	4,857	1,104	5,961	2,799
1948	5,083	1,932	7,015	3,129
1949	4,154	2,248	6,402	2,924
1950	3,485	2,541	6,026	2,770
1951	4,263	2,866	7,129	2,868
1952	3,998	2,682	6,680	3,190
1953	4,293	4,077	8,300	3,342
1954	4,474	....	....	3,736

Bay was 20 million bushels (De Broca, 1865). This level of annual production was sustained until the early 1890's (Table II), but thereafter the harvest declined steadily. The drop has been much more pronounced in Maryland, where the annual crop in recent years has been only about one-quarter the amount harvested 60 years ago. Superficially, it would appear that the annual oyster crop in Virginia has declined only slightly in the same period. This is true when the seed-oyster landings are included (Table II), but a radical change in the seed-oyster industry has occurred in the past 100 years. Whereas in the nineteenth and early twentieth century Virginia seed consisted of large oysters shipped to northern waters, where they were replanted briefly and then marketed, today almost all Virginia seed is replanted within State waters. Therefore these same oysters now appear again in the records as market oysters. Thus, although in earlier years seed and market oysters together correctly designated the total Virginia harvest, more recently the total crop is represented by the market oysters alone. On this basis, it appears that Virginia now markets only about half the amount of oysters she formerly produced.

The supply of blue crabs, another seafood in which Virginia leads the nation, always has been erratic. In some years crabs are so abundant that the catch exceeds the demand; in others, so scarce that the industry suffers real hardship. Careful study of the history of the crab fisheries has produced no evidence that fishing operations or other human activities have influenced the capacity of the resource to renew itself, and it seems fairly obvious that the biological fortunes of the crab fisheries are determined in large part by natural forces. Certainly, within the past quarter-century, the catch has oscillated through several highs and lows (Van Engel, 1954; McHugh, 1955) and there is no reason to doubt that this condition has existed always (McHugh and Ladd, 1953).

The migratory fishes, the mainstay of Virginia's pound-net, haul-seine, and gill-net fisheries, exhibit a similar history of fluctuation. The high point in recent years was reached in the period 1944-1949 inclusive, when the average annual catch of food fishes within the Virginia waters of Chesapeake Bay was about 132 million pounds, greater than in any other 6-year period on record. But fishing in the Bay has not always been so good, and in the available records, the landings of many species exhibit considerable fluctuation. These changes were not entirely due to variations in abundance, it is true, for economic conditions and changing tastes play their part, as we shall demonstrate later. But newspaper files, official reports, and reliable fishermen of long experience are unanimous in their remembrance of the major shifts in abundance. Without a doubt, some species, especially sturgeon and shad, have declined steadily in abundance since the white man came. The striped

bass or rockfish also seems to have decreased in numbers, although there have been several unusually successful spawnings, notably in 1934, 1940 and 1942, that have produced temporary increases in fishing success. These three species return to the rivers each year to spawn, hence are particularly vulnerable to the effects of pollution, dams, and other human agencies. Yet the river herrings, apparently equally vulnerable, seem to be more abundant in recent years than ever before.

Recent declines in the landings of croaker and sea-trout, two of Virginia's most important food fishes, have been attributed to several causes, all associated with man's activities. But there is evidence also of large natural fluctuations in the success of spawning of both species, and the spot, which has similar habits, and is caught in large numbers by essentially the same fishing gears, has shown no parallel decline.

It is clear, therefore, that although the possibility of depletion by the effects of pollution, obstructions, or fishing operations should not be minimized, the great variations in abundance produced by natural forces must not be forgotten. Such natural fluctuations in abundance always will have sociological and political repercussions, and perhaps always will be confused with the effects produced by man.

RECENT HISTORY OF VIRGINIA'S FISHERIES

The reports of the Virginia Commission of Fisheries and the various fishery agencies of the U. S. Government, dating back almost to the middle of the nineteenth century, are often biased, full of conjecture completely unsupported by facts, and contradictory. Nevertheless, they present many interesting sidelights on the fisheries of their day and on the philosophy of the people engaged in them. The fishery statistics of the United States, published by the U. S. Government, contain a wealth of material, from which we have extracted the information on landings and landed values used herein. The average annual price per pound was derived by dividing the total recorded value for each species by the total recorded weight, and these figures were adjusted according to the wholesale price indices for farm products as published by the Bureau of Labor Statistics.

THE OYSTER

The commercial packing of oysters, an industry that began in Maryland in the 1830's, was not important in Virginia until after 1865. Growth of the industry was rapid, and near the turn of the century the annual production in Virginia alone reached 10 million bushels (Table II).

The per capita consumption of oysters in the United States 100 years ago was almost unbelievable by present-day standards. According

to De Broca (1865), in towns along the Atlantic coast, oysters formed a part of the daily food of almost every family. Large restaurants especially intended for the sale of shellfish were common everywhere, and in New York City alone there were more than 300 of these establishments. Oysters also were sold in small shops, and at stalls in the open street. In 1865, the consumption of oysters in New York City was almost seven million bushels. At that time the population of the city was less than 900,000 people, and the per-capita consumption therefore was almost 8 bushels a year, or 5 oysters per day, for every man, woman, and child in the city! If this rate of consumption had persisted, New York City alone would now consume about 61 million bushels of oysters each year, four times the present oyster production, of the entire United States!

In the first few years of the twentieth century oystering in Virginia continued to expand. New oyster houses were put into operation each year, and by 1903, more than 8,000 licenses were issued for hand-tonging as well as several hundred each for patent-tonging and dredging. But in the season of 1907-1908 calamity struck, partly as the result of the depression that was just ending, but perhaps mostly from a pollution scare that reduced the demand. The details of this "pollution scare" are not complete in the records examined, but the passage of the pure food and drug act in 1906 undoubtedly laid the foundation, and the resulting restrictions on the marketing of oysters from polluted areas near the larger cities erected the first barriers to public acceptance of oysters. The 1908 report of the Virginia Commission of Fisheries states that the ban on Virginia oysters was not justified, and that this was the most unsatisfactory oyster season in many years.

By 1910 a substantial recovery had taken place, and it is said that the season of 1910-1911 rivalled 1907, the peak year before the "pollution scare" of 1908. This same report stresses an increased production of oysters from the natural grounds and a sharp decline in the acreage of ground under lease.

From the early 1900's the Commission became increasingly pre-occupied with pollution problems. The prevailing attitude of the industry toward the then recent sanitation laws is undoubtedly echoed in the Commissioner's rather contemptuous reference to the "pure food craze." It is interesting to speculate on the effect that this attitude may have had on the demand for oysters. Later, however, the Commission took an increasingly serious view of the growing pollution problem, caused primarily by the discharge of untreated sewage.

The oyster industry continued to prosper, according to reports of the Commission, until the season of 1924-1925, when another pollution scare affected the market. In the fall of 1924 a health officer in Chicago

issued some general remarks on the purity of oysters. The ensuing publicity seriously affected oyster sales over the entire country. The report for 1925-27 stated that the setback was temporary, and that oysters again were in great demand and prices excellent. This optimistic view is not well supported by the published catch records, however, and it is significant that although the population of the United States had been increasing rapidly for some years, neither the production of oysters, nor the price, increased proportionately.

In the 1920's the conviction grew that a shortage of cultch was developing on the natural oyster grounds. A seafood survey commission, appointed by Governor Byrd in 1927, recommended a special tax on oysters to finance the planting of shell on these grounds. This plan was put into action in 1929, and "repletion" activities have become an increasingly important function of the Commission.

The 1929-1930 season was marked by a serious mortality in Mobjack Bay and the York River, when 75 per cent of the oysters on planted grounds died. Dr. H. F. Prytherch, assigned by the U. S. Bureau of Fisheries to investigate the catastrophe, was not able to identify the cause positively, which was hardly strange, for his investigations began well after the deaths had occurred. But his studies emphasized the importance of scientific fishery research, and in 1931, Dr. V. L. Loosanoff, now a leading authority on the oyster, was employed by the State. A year later Dr. Loosanoff's appointment was terminated for lack of funds, and Virginia conducted no marine research again for several years.

Reference to oyster drills or screwborers as a growing pest on oyster grounds within the Bay arose in the early 1930's. The inference was that these predators were responsible, together with over-exploitation, for the decline of many natural oyster grounds. In recent years, oyster drills have come to be recognized as a major pest on Virginia grounds.

A heavy strike of young oysters in the James River was reported in 1930. In the 1931-1932 season it was said that the supply of seed far exceeded the demand. It is not entirely clear whether this was caused partly by an unusually abundant supply, for the market for oysters in the depression years was poor, and planters apparently held their crops on the grounds rather than sell them at the low prevailing prices. Thus there was little ground available on which to plant seed, and probably little interest in further planting.

The oyster industry did not prosper in the 1930's. Heavy mortalities were reported in the winter of 1935-36, caused by unusually low temperatures, ice, freshets, and gales. The preceding winter apparently also had been severe, and the seed harvest in the James River in 1936-37 was unusually small in consequence. It is difficult, however, to escape the

conclusion that economic factors played a large part in the ills of the industry, for the demand for oysters certainly dropped during the depression. Excessive publicity given to the growing problem of domestic pollution also may have affected the market adversely.

In the late 1930's a research laboratory was established at Yorktown by the U. S. Government to investigate industrial pollution of oyster grounds in the York River. The investigation was financed partially by Virginia. Impressed with the value of scientific research, the General Assembly appropriated funds to establish the Virginia Fisheries Laboratory, which was inaugurated in 1940 at the College of William and Mary.

The season 1942-1943 was described as one of unprecedented prosperity for the oyster industry, and the period 1943-1945 was called the "golden age of the oyster business." The sudden burst of prosperity was caused by World War II with its stringent rationing of meat. The demand for oysters, and the price (Fig. 2), rose sharply, and this in turn led to substantial increases in the annual landings of oysters and in the acreage of ground under lease. At the close of the war the price fell as abruptly as it had risen, but the total crop of oysters continued to rise as the increased plantings, stimulated by the earlier high prices,

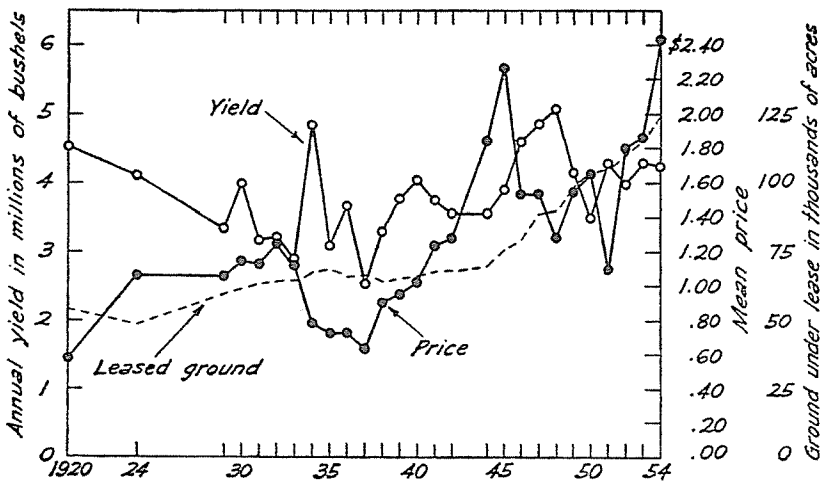


FIGURE 2. Annual landings of market-sized oysters in Virginia, 1920 to 1954, average annual price in dollars per bushel, and amount of planting ground under lease. Prices are expressed in standard dollars based on the Bureau of Labor Statistics wholesale price index for farm products.

reached market size. Probably this very abundance forced the price to its low point in 1948, for as production fell off again, the price rose. The steady increase in ground under lease probably reflects the continued decline in the harvest of market oysters from the natural grounds. Recent high prices can be attributed to a decreased supply caused by hurricane losses, disease, and poor growth in Virginia, and poor sets in northern waters, plus increased sales stimulated by the efforts of the Oyster Institute of North America, and by the development of new products, such as frozen oyster stew, frozen breaded oysters, and oyster sticks.

THE BLUE CRAB

As early as 1903 it was suggested that fishing activities might affect the future supply of crabs. The report of the Virginia Commission for that year stated that crabs were abundant, that the soft crab fishery was not harming the resource, but that danger lay in the lower part of the Bay, where the mature females congregate and are exploited heavily by the early spring fishery. Again in 1911 the great abundance of crabs was mentioned, but the protection of sponge crabs was urged. By 1915 the situation had changed, as illustrated by the following quotation from the Commissioner's report:

"The supply of crabs has now decreased to such an extent as to threaten the very existence of the industry, and fishermen are unanimously of the opinion that, unless proper protective legislation is enacted, the crabbing industry will soon be a thing of the past. We are of the opinion that the present scarcity of crabs is due directly to the failure to prevent the catching of ovigerous females which have not spawned."

One can recollect similar statements in recent years.

At its 1916 session, the General Assembly passed two laws restricting the take of crabs, one banning the capture of sponge crabs in certain months, the other establishing a minimum width of 5 inches for hard crabs. The 1916 season was a profitable one, and this was attributed to the effects of these laws. Nevertheless, a scarcity of crabs was noted again in the 1919-1921 report.

Detailed records of the success of crabbing have been kept since 1924-1925, with a gap in the period 1927-1930. These records show the *availability* of crabs to the fishermen, hence are more useful biologically than the total catch, which is affected by the demand, the number of fishermen, the weather, and other factors. The availability of crabs varies widely, the best season having been about five times as good as the poorest, but the general trend has not been downward, as reports often suggest. Alarming indications often appear in short-term records,

however, and the decline in the success of crabbing from the 1931-1932 high to the 1941-1942 low must have created consternation.

The Commissioner's report of 1931 mentions an "overabundance" of crabs. The 1932 report states that the great abundance had affected the price. Later reports recognize the gradual drop in crab production and repeatedly stress the opinion that sponge crabs should be protected. A sanctuary established in 1941, in the area where the spawning females congregate, has been credited by many with the apparent recovery of the resource, but in the ensuing period there have been equal numbers of good and poor seasons. Obviously, protection of sponge crabs is not the complete remedy that public opinion would suppose.

THE MIGRATORY FOOD-FISHES

Much has been written about the changing fortunes of the food fisheries, in Virginia as elsewhere in the United States. Characteristically, the story is one of depletion and hardship. The most important food fish of the early days was undoubtedly the shad. As pointed out above the shad was particularly vulnerable to the effects of dams and pollution, and though the catch in recent years is considerably smaller than it was at the peak of the fishery, the shad maintained its position as the most valuable food fish of Virginia until well into the present century.

As early as 1893 it was believed that Virginia's fishery resources were declining. The Commissioner of Fisheries (Wilkins, 1894) stated:

"the question of greatest importance to our fishermen is the appalling decline in the number of the free migratory fishes that annually visit the waters of our State."

The 1903 report of the Virginia Commission of Fisheries stated:

"It is an alarming fact that all of the finer varieties of fish are becoming less abundant."

Non-enforcement of the laws, and the "destructive" action of pound nets were cited as the major causes of the reported decline. Yet 1911 was described as the greatest year in Virginia seafood history:

"Never before in our history have we seen such abundance of fin-fish"

But only four years later the prevailing opinion had changed:

"Legislation, however, is badly needed for the protection of both fish and crabs, as the supply of some of our best varieties of fish has been decreasing for years Our fishing industry is in a very unsatisfactory condition . . . owing to the growing scarcity of many of our best varieties."

By the next year (1916) optimism had returned and the season was described as the most profitable in years, with all varieties, especially shad, more plentiful than usual, and prices good.

In 1923 it was stated that fish catches were down during the war and for two years after because manpower was lacking, but that the situation had improved. The fish catch received very little attention in reports issued during the 1920's, and this suggests that the threatened scarcity failed to materialize. The report for 1931 mentions an abundant food-fish supply. The newly-established trawl fishery in the ocean off the Virginia capes was expanding rapidly also, and in 1932 there were

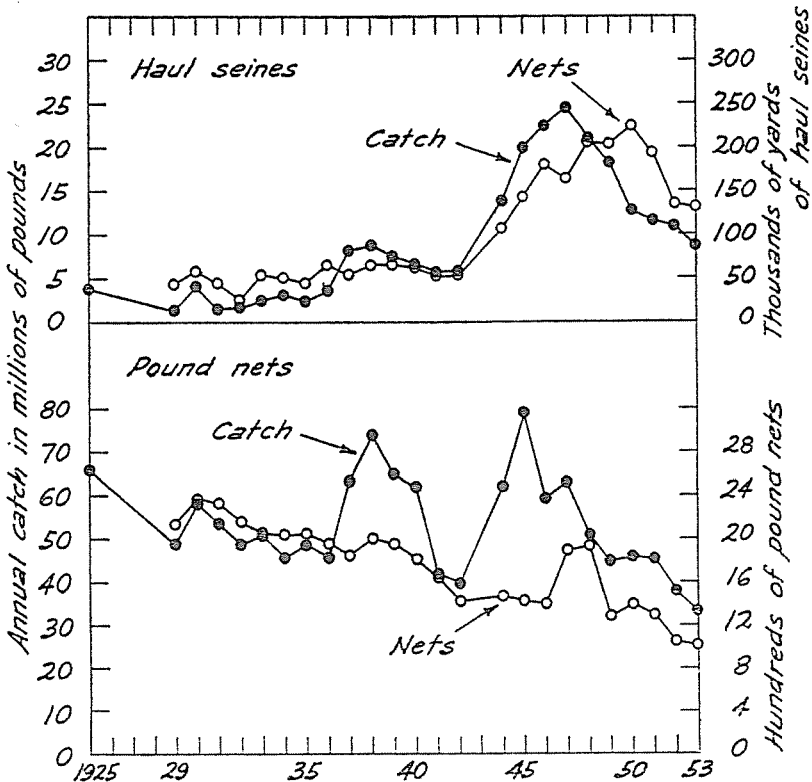


FIGURE 3. Annual catch by haul seines in Virginia, 1925 to 1953, and numbers of yards of nets licensed; and annual catch by pound nets for the same period, and numbers of pound nets licensed.

22 Virginia-owned trawlers in operation. Fish were abundant in 1932, but prices were low. In 1933 there was an excellent supply of croakers and other pan fishes in the Bay, but the ocean fisheries were not too successful and some boats dropped out.

By 1935, the increased cost of fishing gear, with no increase in prices, brought an unprofitable season to Virginia fishermen, and this condition persisted until the early 1940's. The trawl fishery continued to grow and show fair profits, however, probably because the gear was more flexible and efficient than the pound net. It was recognized that refrigeration and transportation problems placed Chesapeake seafoods in an unfavorable competitive position with fishery products from other areas. In 1939 it was pointed out that the demand for all Chesapeake seafoods had declined in recent years.

The war seems to have brought prosperity to all segments of the fishing industry in Virginia. A part of the increase in landings may well have been caused by an increased intensity of fishing stimulated by the unusually high prices, but there is little doubt that an increased abundance of croakers and perhaps some other species also contributed. The close correspondence between the number of pound nets and the pound-net catch, and the total length of haul seines licensed and the haul-seine catch.

(Fig. 3) suggest that there has been no progressive decline in the total catch abundance of all food fishes in Virginia since 1929. Unfortunately, however, when prices are high or abundance is temporarily increased, there is a certain time-lag in the response of fishermen. This delayed response, quite evident in figure 3, usually places the heaviest fishing effort at a time when abundance, or prices, or both, are already falling. The present trend seems to support the conclusion of Taylor (1951) that the ills of these fisheries have an origin that is primarily economic.

Another interesting feature of figure 3 is the increasing importance of the haul seine relative to the pound net. Pound nets are much more costly to install and operate, and they are subject to destruction by storms. Under these circumstances the haul seine may be a more effective gear in many localities. In 1925 only about 2 per cent of all food fishes landed in Virginia were caught in haul seines, but by 1950 this fishing gear accounted for 17 per cent of the food-fish catch.

Two recent events illustrate the reduced demand for Virginia food-fishes. When the shad catch rose in 1952 to almost 6 million pounds, only about half the average catch at the turn of the century, the price fell so low that fishing became unprofitable, and many fishermen dropped out well before the season ended. The improved catch of croakers in the spring of 1956 glutted the market so that the price fell as low as two cents per pound, and many fish were wasted for lack of a market.

Returns to former levels of abundance brought no benefit to the industry, probably because frozen products, such as fish sticks, from other areas have captured the market. Most Chesapeake fishes, because they are small and contain proportionately little meat, cannot be prepared economically as fillets, fish sticks or blocks. Perhaps a market could be developed for fresh-frozen, dressed panfish, emphasizing the best features of Virginia or Chesapeake varieties. A few progressive processors are testing such products.

HISTORICAL PERSPECTIVE ON TODAY'S MAJOR PROBLEMS

As Quittmeyer (1950) has pointed out, the chief preoccupation of Virginia's fishing industry has been with the physical supply, presumably on the assumption that marketing problems would work themselves out automatically. Perusal of historical records, however incomplete they may be, is apt to convince the reader that biological factors are not the only things affecting the welfare of the commercial fishing industry. Indeed; sociological, economic, and political forces often equal or exceed in magnitude the purely biological aspects.

The history of Virginia's fisheries over the past quarter-century provides an ideal example of the interaction of all the major forces that shape the well-being of her fishermen. The aftermath of the great economic depression is clearly marked on the record of seafood prices. The reports of the Commission of Fisheries continually stress the low prices that prevailed throughout the 1930's, and there is little or no evidence that the recurring complaints of hardship were caused by a biological scarcity of any of the important species. Indeed, there are several indications that the seafood supply was better than average, particularly in the second half of that decade.

Many of the recent complaints can be traced to the economic upheaval generated by World War II. The prices of all seafoods rose to unprecedented heights during the war, and reached a climax in 1945 (Figs. 2 and 4). Meat rationing probably was the chief cause of the unusual demand for seafoods, and the absence of controls on seafood explains the high prices, but it seems clear also that some of the major food fishes, especially croaker, were unusually abundant at the same time (Fig. 5). This combination of high biological productivity and unusually favorable economic conditions set the stage for the sociological fishery problems of the present day.

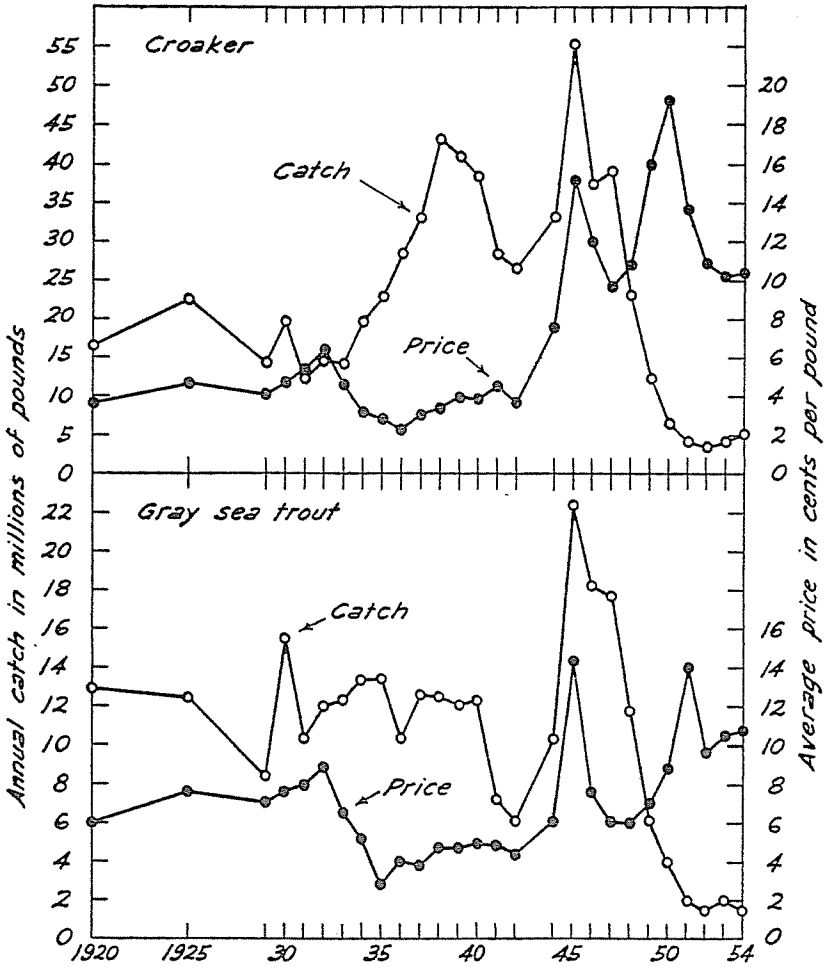


FIGURE 4. Annual catch of croakers and gray sea trout in Virginia, 1920 to 1954, and the average annual price in cents per pound. Prices are expressed in standard dollars based on the Bureau of Labor Statistics wholesale price index for farm products.

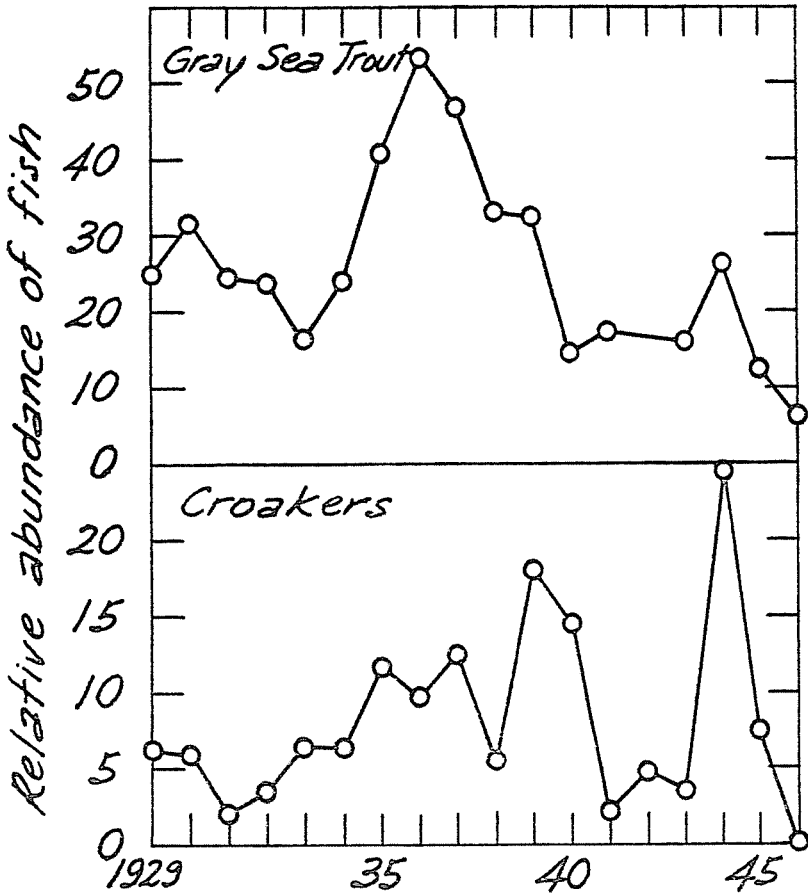


FIGURE 5. Relative annual catch of gray sea trout and croakers per net per day, for the period 1929 to 1946, in a series of pound nets fished in the ocean off the eastern shore of Virginia.

The high prices of the mid-1940's undoubtedly attracted men back into the fishing industry. As might be expected, however, there was a time-lag in the response to these favorable conditions. For example, as mentioned previously, the increase in numbers of pound nets and haul seines lagged two or three years behind the high prices and high catches. The delay may have been shorter if most of the available men had not

been serving in the armed forces. The result was that, in the period 1947-1950, perhaps the greatest effort ever expended in the history of Virginia's fisheries was exerted at a time when both the supply and the price had fallen from unusually and artificially high levels. One need not look back farther than 1945 to find the cause of most of today's fisheries problems. In the memory of fishermen, the war years are the "norm" to which legislation and scientific research will restore their fortunes, but in truth such bountiful times were the fortuitous result of an unusual set of circumstances that may not recur in their lifetimes nor in many generations to come.

Soon after the concurrent declines of prices *and* the catch of the major food-fish species in the years following 1945, the price of most species, particularly croakers and trout (Fig. 4), took an equally abrupt upswing. This probably occurred in response to the alarming drop in catches of both species. In other words the price responded this time to a biological scarcity of fish. But in the face of abruptly falling catches this did nothing to improve the economic situation of the industry. The abrupt reversal of this price increase, at a time when catches were still falling sharply, seems equally significant. The rapid growth of the frozen-fish industry, especially with the introduction of fish sticks, and the lure of attractive packages and ease of handling, coming at a time when croakers and trout from Chesapeake Bay were disappearing from the markets, probably was the final coup. That the demand for croakers fell off with the recent decline in abundance seems to be well illustrated in the current fishing season, when a sharp increase in catches has not brought the wave of prosperity that was anticipated. The bountiful catches of April and May 1956 soon brought prices to ridiculously low levels, and many fish were wasted for lack of markets. In competition with the relatively cheap and attractive frozen product from the northeast it seems almost impossible for the major Virginia species to regain their former position, although imaginative processors may regain at least a portion of their lost markets by adopting modern methods of preparation and selling, as some already have done.

An almost parallel, though not yet quite so disastrous, situation has existed in the oyster industry of the Peninsula and the State (Fig. 1). There has been a slow but steady decline in the harvest of market oysters, not only in Virginia, but along the entire coast, since the first reasonably accurate records were made in 1887. In Virginia, production reached a low in the 1930's (Fig. 2), and it is interesting that the unit price reached a minimum at the same time. According to Taylor (1951) it is significant that the price of oysters has not risen in response to the diminishing supply, especially as the human population has been increasing in numbers and in standard of living. The causes are undoubtedly complex, including changing tastes, a wider variety of competitive foods, and improved

methods of processing and marketing of all protein foods. A probable factor of importance is the rising cost of labor and materials in an industry that does not lend itself easily to mechanization. There is no doubt also that biological factors have contributed to the declining crop, for it is well known that the production of market oysters from the public grounds in Virginia, as elsewhere, has decreased considerably. But when the demand is sufficient, and prices warrant the effort, apparently the harvest can be increased considerably, as illustrated by the increase from about 3 1/2 million to over 5 million bushels in the 1940's. Unfortunately, it requires two or three years to raise a crop of oysters, and the increased crops stimulated by the high prices of 1945 came too late for profit. The sharp recession in production after 1948 speaks for itself. Good prices have prevailed for Virginia oysters since 1954 as a result of biological scarcity, and the development of new products, such as frozen oyster stew, promises a bright future for the industry. But high costs of production and the poor supply have cancelled out some of the benefits that the favorable market created. The margin of profit would be increased if oysters could be produced more cheaply. This goal may be achieved through more frequent harvesting and control of enemies and diseases. Another possibility, as Dr. Taylor has proposed recently, is to improve the quality and flavor of oysters, emphasizing the delicate natural flavor of the oyster rather than destroying it by excessive blowing or washing.

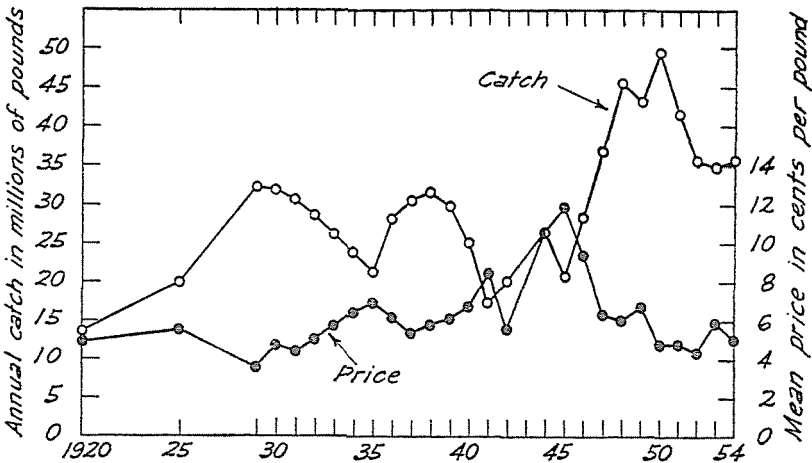


FIGURE 6. Annual catch of blue crabs in Virginia, 1920 to 1954, and the average annual price in cents per pound. Prices are expressed in standard dollars based on the Bureau of Labor Statistics wholesale price index for farm products.

In its main features, the blue crab fishery seems to have responded to changing biological and economic conditions in much the same ways as the oyster and the food fishes (Fig. 6). The annual catch reached maxima at the beginning of the 1930's, in the late 1930's, and in 1950, and each of these high points corresponds to a period of known biological abundance. In each period also, the price fell as the catches rose. Crab prices climbed during the war, to a maximum in 1945, but this coincided with a period of biological scarcity, and the total catch did not increase substantially in response to the favorable market. The three major dips in the annual catch, in the mid-1930's, the early 1940's, and the early 1950's each coincided with a period of relative scarcity of crabs, and the price responded accordingly. Biological research can help the crab industry by investigating availability in the waters of other states where crabs are relatively abundant. Perhaps scarcity in one region may be balanced by plenty in another. Improved methods of processing and preservation, particularly to speed up the costly and wasteful process of hand-picking, to eliminate shell from the picked meat, and to permit storage in times of great abundance, would benefit the industry.

The menhaden is not used as food for humans, hence its economic status is governed by an entirely different set of forces. We have not considered this fishery in any detail here, because menhaden are not of any importance directly to the Peninsula. But it is worth noting that the menhaden industry has profited from technological advances, which are continually developing new uses for the oil and scrap, improving the efficiency of the processing operation, and finding uses for by-products formerly wasted. The price of menhaden, as computed from the U. S. Fish and Wildlife Service records, has not exhibited the major oscillations characteristic of all the seafood species, and it is particularly interesting that no boom in prices developed during World War II. Superficially, it would seem that the menhaden fishery in Virginia is in a much stronger economic position than any other marine resource, although it is still subject to the effects of fluctuating biological supply. A thorough study of the history of this fishery in all its aspects might provide valuable lessons for the improvement of all our fisheries.

SUMMARY AND CONCLUSIONS

The recent historical record seems to explain very clearly current pessimism as to the condition of Virginia's marine fisheries. Artificially high prices during the last war created a temporary period of prosperity, and the illusion unfortunately was heightened by an unusual abundance of some of the migratory food fishes, especially croaker and trout. An equally artificial condition developed at the close of the war, when both prices and the biological supply of these fishes fell rapidly.

Another important factor which has narrowed the margin of profit in most branches of the seafood industry in recent years has been the sharply rising cost of labor and materials. Many operations in the catching and processing of seafoods still require hand labor, and mechanical substitutes are slow to come. The producers of most Virginia food fishes also have suffered from competition by the cheaper and more attractive frozen fillets and fish sticks from the northeast. The demand for oysters and blue crabs perhaps also has been supplanted to some extent by the rapidly-growing shrimp industry.

Biological research, to be of significant economic value to Virginia's fisheries, eventually must point the way to reduced costs of production. Recent findings by the Virginia Fisheries Laboratory, that oyster yields may be improved by more frequent harvesting, are a step in this direction. Predictions of blue crab and food-fish abundance also might aid efficient harvesting of these resources. The importance of basic biological research in achieving this objective cannot be overemphasized. Practical solutions to these many problems will depend on a thorough understanding of the habits of marine animals and their reactions to the environment. This basic information also is needed urgently to guard against the growing threat of industrial pollution.

But careful study of the history of the fisheries, incomplete though the record is, scarcely can fail to impress the reader with the importance of economic and sociological forces in shaping the welfare of the industry. Nowhere is this truth more apparent than in the important fishing State of Virginia. Yet fishery research everywhere has traditionally emphasized the biological aspects of the industry's problems, and when economic problems have been investigated, they have been concerned almost exclusively with the technical aspects of fishing or processing.

The concept of fishery research as a method of obtaining the maximum sustained (or equilibrium) yield of each useful product of the sea is not adequate so long as this definition embraces only the biological factors. But the other important factors can be included without rewriting the definition. The objectives of fishery research are not in doubt, but the means of attaining the desired ends through scientific investigation perhaps never have been clearly nor completely stated.

Virginians sometimes are criticised for their preoccupation with past events. It is perhaps appropriate that a consideration of historical matters, in this most historic of all the States, should lead to a broader understanding of a very pressing modern problem — the efficient utilization of a bountiful natural resource, and the economic and social stability of the people who use it for business and for pleasure.

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